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If cited in the literature the information is to be identified as tentative and unpublished.

Technical memo.

TECHNICAL MEMORANDUM NEL-TM-1030

ASW SHIP COMMAND AND CONTROL SYSTEM: MANEUVER/EVALUATION MODULE ACCEPTANCE TEST PLAN FOR THE CVS

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FOREWORD

The information contained in this document SHOULD NOT BE RELEASED TO THE CONTRACTOR. It is not necessary, nor advisable that the organization preparing the operational programs know what will be tested, what will not be tested, or how. This will assure that portions of the system have not been reinforced/given special attention in order to meet test criteria.

This document has been prepared primarily for internal distribution to aid others at the U. S. Navy Electronics Laboratory who are working on the ASW Ship Command and Control System. Only limited distribution outside of the laboratory is contemplated.

Distribution of this document by the Project Office may be interpreted as endorsement of its contents. The work was performed by members of NEL Code 3320, Operations and Systems Analysis Division under NEL Problem J70972 and in support of NEL problem J70973 Test and Evaluation.

Approved   Approved

LCDR R. K. Harriott, USN   Mr. J. Paul Ward
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ASW SHIP COMMAND AND CONTROL SYSTEM

MANEUVER/EVALUATION MODULE ACCEPTANCE TEST PLAN

FOR THE CVS

Index

SECTION I.   INTRODUCTION

The information contained in this document constitutes a detailed program acceptance Test Plan for certain functions of the Maneuver & Evaluation module that are part of the ASWSCS&CS system to be installed aboard a CVS. The ASWSC&CS system installation on the CVS and two new construction DE s will be given a technical evaluation in 1967.

This Test Plan includes only those functions of the Maneuver & Evaluation module that are unique to the CVS installation. Other module functions that are common to both DE and CVS installations are covered in another document.[1]

A. Purpose

The purposes of this Test Plan are:

1. Verify correct functioning of Hazardous Track routine.

2. Verify correct display of ASW screens and reoriented screens.

3. Verify correct display of ASW search plans.

4. Verify accuracy of Recommended Course and Speed display.

5. Verify accuracy of Helo Dipping Vector display.

6. Verify accuracy of Sonar Conditions display.

7. Verify correct system response with regard to input, storage, and display of Aircraft Status.

B. Identification of Program and Environment

The operational computer program modules directly involved in this acceptance test may be identified as those submitted by the contractor for

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[1] ASW Ship Command and Control System Maneuver/Evaluation Module Acceptance Test Plan for Those Functions Common to Both DE and CVS.

certification and which meet the specifications described in the following documents:

1. ASW Ship Command and Control System Operational Specification Maneuver and Evaluation Module N-122, PSRA No. 203, dtd 5/27/66, Confidential.

2. ASW Ship Command and Control System Functional Specification Maneuver and Evaluation (U) CVS, FSRA No. 87, FS ID FSMV2, FS Status Final, Op Change No. 1, Tech Change No. 3, dtd 24 October 1966, Confidential.

3. ASW Ship Command and Control System Task Specification for CVS Mod 1, PSRA No. 188, dtd 3/24/66, Confidential.

The environment in which the operational programs are to be certified will be simulated in the U. S. Navy Electronics Laboratory's Applied Systems Development and Evaluation Center (ASDEC). The simulated environment will be generated by a general purpose computer complex. Environmental characteristics for which simulation capabilities exist are ownship motion including pitch and roll, radar and sonar sensor simulation, target motion, digital data link terminal, fire control systems, and other subsystems not physically installed in ASDEC. The specifications relevant to the simulation requirements of this Test Plan are given below:

1. ASW Ship Command and Control System Simulation Specification Console Control Module TG&C Subsystem S-205, PSRA No. 175, dtd 2/11/66, Confidential.

2. ASW Ship Command and Control System Simulation Specification Radar Simulation Module S-207, PSRA No. 185, dtd 3/17/66, Confidential.

3. ASW Ship Command and Control System Simulation Specification Wind Simulation Sub Program (WIND) S-305, PSRA No. 111, dtd 10/18/65, Confidential.

4. ASW Ship Command and Control System Simulation Specifications
Wind Data Reduction Format (REDFORM 5 - REDuce FORMat 5) S-105,
PSRA No. 148, dtd. 12/14/65, Confidential.

5. ASW Ship Command and Control System Simulation Specification
Priority Timing Data Reduction Format (PRINTCON (Printer Control))
S-106, PSRA No. 167, dtd 2/1/66, Confidential.

6. ASW Ship Command and Control System Simulation Specification
Magnetic Tape Handler (MAGHAND) S-107, PSRA No. 130, dtd 11/3/65,
Confidential.

7. ASW Ship Command and Control System Simulation Specification
Operational Computer Data Extraction Receiver (DEXRECOP) S-109,
PSRA No. 149, dtd 12/14/65, Confidential.

8. ASW Ship Command and Control System Simulation Specification
(CONDEXREC) S-110, PSRA No. 139, dtd 11/22/65, Confidential.

C. Summary of Structure, Operation, and Evaluation of the Test

The structuring of this Test Plan conforms to the purposes listed previously.
The tests described herein are as follows:

A. Hazardous Track Tests

B. ASW Screen Tests

C. ASW Search Plan Tests

D. Recommend Course and Speed Tests

E. Helo Dipping Vector Tests

F. Display Sonar Conditions Tests

G. Aircraft Status Tests

The operation of the various tests is described in detail in the next section of this document. Most of the above tests are composed of several sub-tests to verify that particular criteria in the specifications are met.

The hazardous track tests include the testing of maximum capacity and ordering of the hazardous track list and the effect of entering a limiting hazardous (CPA) range, maximum range, and/or exclusion track and exclusion track range on the hazardous track list. Also tested is the occurrence of periodic update of the hazardous track list including the program's ability to add or delete tracks according to the criteria entered into the system defining a hazardous track.

The ASW screen tests include testing of a bent-line screen, reoriented bent-line screen (Methods Rum, Coke, and Ginger), advanced screens, equally spaced circular screens, and unequally spaced circular screens.

The ASW search plan tests consist of having displayed most of the ASW search plans stored in the system and recording on film the PPI display of each plan. The plans so tested are Duet, Triplet, Tomato, Trireme, Spiral, Lemon, Keylime, Tiger Two, and Airplan 25.

The tests of recommended course and speed for aircraft launch or recovery investigate the validity of the displayed solutions when the inputs to the system of simulated wind velocity and desired wind velocity are given various values.

The helo dipping vector display is activated and recorded on film to determine that it provides the correct geometry based on the parameters defined by entries made at the console.

The sonar conditions tests verify the correct computation and display of specific sonar parameters displayed on the DRO based on bathythermograph data and other pertinent factors entered at the ASW keyset.

The aircraft status tests include testing of the maximum capacity for storing aircraft status, and that inputs at the aircraft data entry keyset are correctly interpreted, stored, and displayed by the system.

The entry and display characteristics of most of the above tests are also subjected to qualitative testing in another Test Plan document. [2]

Evaluation of the various tests will be accomplished by analyzing the data that is required to be recorded during each test. The data will be recorded from the PPI and DRO by an observer during the test, and in certain cases this will be supplemented by photographs of the PPI display, and data extraction print-out.

[2] NEL/TM 989, ASW Ship Command and Control System: Detailed Display/Keyset Acceptance Test Plan (U), dated 9 September 1966, Confidential.

SECTION II.   TEST DESCRIPTION

This section contains the detailed procedure for the tests outlined in

Section I.C. For each test it is assumed that the program initiation procedures

have been completed and that all operators are familiar with the operation

of the Operational system and the TG&C system.   Personnel and other requirements

are covered in Section III of this memorandum.

A. Hazardous Track Tests

Characteristics of the hazardous track list are checked by the following series of tests.

The following comments apply in general to this series of tests:

- Tracks will be entered from an operations console (no simulation) in order to better control the geometry of the tests.

- No other tracks should be in the system prior to or during the tests except those specified in the tests.

- Course and speed on all tracks are to be entered by using NED entries for Permanent Course Override and Permanent Speed Override, and the Function Code QAB.

Test Details

A1. Track Initiation

a. Enter Ownship Speed of zero and course 000° T.

b. Enter each track listed in Table A1 with characteristics specified except speed. Update in place to obtain firm track. Record in Table A1 the TN assigned by the system as each track is entered.

c. Enter speed for each track listed in Table A1.

d. Enter Ownship speed at 15 kts.

e. Enter tentative track at bearing 000° T, range 5 miles from Ownship and update 2 times to give track an arbitrary course and speed. Note time of entry_____.

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Table A1   Track Entries for Hazardous Track Test

DATE

_____

_____

_____

_____

# TRK	RANGE n.m.	BRG. (deg.)	CATEGORY	ID	CLASS	COURSE (deg.)	SPEED (kts)	TN ASSIGNED	
1	4.67	332	Surf.	-	-	090	20		
2	12	330	Surf.	-	-	090	20		
3	24	330	Surf.	Frnd	-	090	20		
4	36	330	Surf.	Host	-	090	20		
5	48	330	Surf.	-	-	090	20		
6	60	340	Air	-	Helo	090	20		
7	60	330	Surf.	Frnd	-	090	20		
8	72	330	Surf.	Host	-	090	20		
9	80	340	Subsurf	Unknown	-	090	20		
10	80	335	Surf.	-	Carrier	090	20		
11	90	340	Surf.	-	-	090	20		
12	85	80	Surf.	Frnd	-	270	20		
13	85	60	Surf.	Host	-	270	20		
14	85	50	Surf.	-	-	270	20		

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A2. Verify maximum capacity and ordering of hazardous track list:

    a. Enter HAZ TRK via QAB. Note time of Entry_____.

    b. Observe alert

        1. Note time of alert_____.

        2. Note type of alert_____.

    c. Observe DRO for readout of preset values of 512 miles

        for both "Hazard Range" and "Maximum Range."

    d. SEQUENCE in response to alert.

    e. Observe PPI for

        1. Ownship hooked,

        2. Ball tab designates hazardous track.

        3. CPA indicated by reference point symbol.

        4. Relative motion line displayed between

            hazardous track and CPA.

    f. Observe DRO and record information specified in Table A2.

    g. Repeat Actions A2. d, e, and f until all hazardous tracks

        have been recorded.

NOTE: Hazardous tracks should be examined as rapidly as possible

      so that periodic function of Hazardous Track routine does

      not occur before all hazardous tracks have been recorded.

      If repetition occurs, sequence rapidly through tracks already

      examined to reach those hazardous tracks not yet recorded.

    h. Observe and record on Table A2 system response to use of

        "Sequence" QAB after tenth hazardous track has been examined.

i. Specific acceptance criteria for Action A2:

    1. Only firm surface tracks within the
       preset range presented as hazardous tracks.

    2. Maximum of ten hazardous tracks presented.

    3. Ordering of hazardous tracks is according
       to increasing time of CPA.

    4. Proper display on PPI and DRO (FSMV2, Figures 2 and 19)

j. Terminate routine by using HAZ TRK QAB.

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Table A2   Hazardous Track List

DATE

Hazardous Range   =   512 n.m.

Maximum Range   =   512 n.m.

Action A2.f	CPA	RANGE	TIME OF						
	TN	(CPA)	CPA						
Action A2.h System response noted:									

Observers

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A3. Verify effect of entering a limiting CPA range:

a. Enter hazardous range of 25 miles using F CODE.

b. Observe DRO for readout of 25 miles for "Hazard

Range".

c. Enter HAZ TRK using QAB and observe alert.

d. Observe DRO for readout of 25 miles for

"Hazard Range" and 512 miles for "Maximum

Range."

e. Repeat Actions A2.d and e.

f. Record DRO information in Table A3.

g. Repeat Actions A3.e and f until all hazardous tracks have been

recorded.   See NOTE for Action A2.g

h. Acceptance criteria for Action A3:

   1. to 4. same as specified in Action A2.i

   5. all hazardous track CPA s less than 25 n.m.

i. Enter HAZ TRK to terminate routine

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Table A3   Hazardous Track List

DATE

Hazardous Range   = 25 n.m.

Maximum Range   = 512 n.m.

Action A3.f	CPA TN	RANGE (CPA)	TIME OF CPA						

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A4. Verify effect of entering a limiting maximum range:

    a.   Enter hazardous track maximum range of 70 miles

         and hazardous range (CPA) of 25 miles using F CODE.

    b.   Observe DRO for correct readout of range parameters

         just entered.

    c.   Enter HAZ TRK and observe alert.

    d.   Observe DRO for same range parameter readout

         as in Action A4.b.

    e.   Repeat Actions A2.d and e.

    f.   Record DRO information in Table A4.

    g.   Repeat Actions A4.e and f until all hazardous

         tracks have been recorded. See NOTE with Action

         A2.g.

    h.   Acceptance criteria for Action A4.

         1. to 5. same as specified in Action A3.h

         6. all hazardous tracks are within 70 miles

         range.

    i.   Hook each hazardous track and record range

         on Table A4 (for verifying maximum range criteria).

    j.   Enter HAZ TRK to terminate routine.

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Table A4   Hazardous Track List

DATE

Hazardous Range = 25 n.m.

Maximum Range   = 70 n.m.

Action A4.f	CPA TN	RANGE (CPA)	TIME OF CPA		RANGE (Action A4.i)				

Observers   Sheet   of   Sheets

A5. Verify effect of entering an exclusion track and exclusion

track range:

a. Repeat Action A4.a.

b. Hook #4 track (Table A1) and enter exclusion

range of 15 miles using F CODE.

c. Observe DRO for correct readout of range parameters

just entered.

d. Enter HAZ TRK and observe alert.

e. Observe DRO for same range parameter readout as in Action

A5.c.

f. Repeat Action A2.d and e.

g. Record DRO information on Table A5.

h. Repeat Actions A5.f and g until all hazardous tracks

have been recorded. See NOTE with Action A2.g.

i. Acceptance criteria for Action A5:

1, to 6, same as specified in Action A4.h.

7. #3, #4, and #5 tracks (Table A1) no longer

on hazardous track list.

j. Hook each hazardous track and record range

on Table A5 (for verifying maximum range criteria)

k. Enter HAZ TRK to terminate routine.

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Table A5.   Hazardous Track List

DATE

Hazardous Range = 25 n.m.

Maximum Range = 70 n.m.

Exclusion Range = 15 n.m.

Exclusion Track (#4 Track on Table A1)

Action A5.g	CPA	RANGE	TIME OF		RANGE				
	TN	(CPA)	CPA		(Action A5.j)				

Observers   Sheet   of   Sheets

A6. Verify that periodic function of Hazardous Track routine occurs within 3 min. interval.

a. Drop any track(s) within 6 mi. of ownship.

b. Enter Ownship speed of zero.

c. Enter #15 and #16 tracks listed in Table A6 with characteristics specified except speed.

d. Enter speed specified for #15 and #16 tracks, and enter Ownship speed of 15 knots.

e. Enter hazardous track range parameters:

Hazardous range = 5 mi.

Hazardous track maximum range = 6 mi.

f. Initiate hazardous track routine via QAB with minimum amount of time between Actions A6.d and f.   Record time of initiation_____.

g. Observe alert pending for hazardous track and record time when alert is cleared as a result of recycling of routine after #15 track has left hazardous range zone. (Record time in Table A6).

h. Continue to observe and record time that alert appears (in Table A6) as a result of recycling of routine after #16 track has entered hazardous maximum range zone.

i. Enter SEQUENCE to verify #16 track is cause of alert.

j. Acceptance criteria for Action A6:

1. Initial alert cleared within 3 min. after time noted in Action A6.f.

2. Second alert appeared within 6 min. after time noted in Action A6.f.

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TITLE

Table A6   Establish Recycle Time of Haz. Trk. Routine

DATE

_____

_____

_____

_____

TRACK #	RANGE (yds)	BRG (°T)	CATEGORY	COURSE (°T)	SPEED (kts)	Record Time Initiate Routine (Action A6.f)	Alert Cleared (Action A6.g)	Alert Appears (Action A6.h)	
15	7060	22.5	Surf.	090	20			--	
16	13,930	350.3	Surf.	090	20	--	--		

Observers   Sheet   of   Sheets

B. ASW Screen Tests

This section contains a series of tests to verify the correct presentation and reorientation of various ASW screens. ATP 1(A) is the source for defining correctness of the displays. No simulation is required during the tests. All screen inputs should be made from the same console mode unless otherwise stated.

Test Details

B1. Track Initiation

a. Ownship heading of 000°T.

B2. Verify correct presentation of Bent Line Screen

a. Enter SCREEN via QAB.

b. Observe "No Screen" displayed on DRO (unless screen already in stores).

c. Repeat Action B2.a to delete readout.

d. Hook Ownship.

e. Enable and position Ball Tab at 1600 yds and 000°T (representing ESR and Search Axis, respectively).

f. Set 05019 in NED (for 5 ships in Bent Line screen) and enter F CODE.

g. Enter SCREEN via QAB.

h. Observe Bent Line screen represented by five ⨎ symbols on PPI and "Screen Axis 000" on DRO.

i. Hook leftmost screen station to obtain Station Number readout on DRO and then Ball Tab same station with Hook disabled to obtain

range and bearing from Ownship (screen center). Record this data on Table B2.

j. Repeat Action B2.i for other 4 screen stations.

k. Acceptance criteria for Action B2:

    1. Correct screen station symbology on PPI.

    2. Correct geometry for bent-line screen as verified by readout of screen station number, range, and bearing data recorded on Table B2.

l. Enter SCREEN via QAB and observe screen display cleared from PPI and DRO.

m. Enter SCREEN via QAB and observe same screen display as before.

n. Repeat Action B2.l.

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Table B2   BENT-LINE SCREEN

DATE

R_o = 1600 yds
N = 5
Screen Axis 000°T

RESPONSE

	SCREEN	CORRECT		OBSERVED					
	STA. #	Range	Bearing*	Range	Bearing*				
Action B2.i	4	8500	293 °T						
Action B2.j	2	7000	322 °T						
Action B2.j	1	5500	000 °T						
"	3	7000	038 °T						
"	5	8500	067 °T						

* from Screen Center (Ownship)

Observers   Sheet   of   Sheets

B3. Reorient bent-line screen by Method Rum

    a. Enter new screen axis of 060 °T and specify use of Method Rum (0 set in middle NED).

    b. Enter REOR SCRN via QAB.

    c. Observe "Illegal Action" alert because no screen split occurs with the new screen axis specified (Method Rum used for split screen condition).

    d. Enter new screen axis of 130 °T and specify use of Method Rum to perform reorientation.

    e. Enter REOR SCRN via QAB.

    f. Observe bent-line screen symmetrically displayed on the PPI with respect to the new screen axis, and proper screen axis readout on the DRO.

    g. Hook leftmost screen station to obtain station number and record range and bearing of station from Ownship (screen center) on Table B3.

    h. Repeat Action B3.e for other 4 screen stations.

    i. Set -- 120 in NED and enter F CODE to replace old screen station numbers with new.

    j. Hook screen stations and record new screen station numbers in Table B3 corresponding to positions identified by "old" station numbers.

    k. Acceptance criteria for Action B3:

        1. Correct display of reoriented screen on PPI and amplifying data on DRO.

        2. Correct geometry of screen stations with respect to screen center.

    k. Correct assignment by program of "old" and "new" screen station

       numbers for reorientation by specified method.

   l. Delete screen from display.

B4. Reorient bent-line screen by Method Ginger

    a. Enter new screen axis of 180 °T and specify use of Method Ginger

      (1 set in middle NED).

    b. Repeat Actions B3.e to j except record data on Table B4.

    c. Acceptance criteria for Action B4:

      1, 2 and 3 same as stated in Action B3.k.

    d. Delete screen from display.

B5. Reorient bent-line screen by Method Coke

    a. Enter new screen axis of 330 °T and specify use of Method Coke

      (1 set in middle NED).

    b. Repeat Actions B3.e to j except record data on Table B5.

    c. Acceptance criteria for Action B.5:

      1, 2 and 3 same as stated in Action B3.k.

    d. Delete screen from display.

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TITLE

DATE   Tables B3, B4, and B5   REORIENTED BENT-LINE SCREENS

$R_o = 1600$ yds
$N = 5$

	SCREEN AXIS	OLD STA #	CORRECT RESPONSE			OBSERVED RESPONSE			
			Range (yds)	Bearing*	New Sta #	Range (yds)	Bearing*	New Sta #	
Table B3	130 °T	4	8500	197 °T	5				
(Method		2	7000	168 °T	3				
Rum)		1	5500	130 °T	1				
		3	7000	092 °T	2				
		5	8500	063 °T	4				
Table B4	180 °T	5	8500	247 °T	5				
(Method		3	7000	218 °T	3				
Ginger)		1	5500	180 °T	1				
		2	7000	142 °T	2				
		4	8500	113 °T	4				
Table B5	330 °T	3	8500	263 °T	4				
(Method		5	7000	292 °T	2				
Coke)		4	5500	330 °T	1				
		2	7000	008 °T	3				
		1	8500	037 °T	5				

*from Screen Center (Ownship)

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B6. Verify correct presentation of advanced screen.

    a. Hook Ownship.

    b. Enable and position ball tab at screen range and screen axis specified in Table B6 for Test Condition 1.

    c. Set N119 in NED (where N is number of stations specified in Table B6 for Test Condition 1) and enter F CODE.

    d. Enter SCREEN via QAB.

    e. Observe PPI for advanced screen represented by "N" ⧫ symbols and screen axis readout on DRO.

    f. Hook leftmost screen station to obtain station number readout on DRO.

    g. Ball Tab same screen station with Hook disabled to obtain range and bearing readout from Ownship (screen center). Record these data in space provided in Table B6.

    h. Acceptance criteria for Action B6:

        1. Correct screen presentation on PPI.

        2. Correct geometry for advanced screen as verified by readout of screen station number, range, and bearing data recorded on Table B6.

    i. Delete screen presentation.

    j. Repeat Actions B6.a through i for each test condition specified in Table B6.

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TITLE

Table B6   ADVANCED SCREEN

DATE

| TEST CONDITION | INPUT | | | STA. # | RESPONSE | | | | COMMENTS |
| | SCREEN RANGE | SCREEN AXIS | N (# Sta.) | | CORRECT | | OBSERVED | | |
					Range	Bearing	Range	Bearing	
1	4000 yds	000 ° T	02	2	4200	340 ° T			
				1	4200	020° T			
2	12,000	045 ° T	03	2	14,200	011 ° T			
				1	12,000	045 ° T			
				3	14,200	079 ° T			
3	22,000	000 ° T	04	4	25,600	328 ° T			
				2	22,200	348 ° T			
				1	22,200	012 ° T			
				3	25,600	032 ° T			
4	3,000	000 ° T	02	-	Illegal	Action			$R_o < 3000$
5	23,000	000 ° T	02	-	Illegal	Action			$R_o > 22,000$
6	5,000	000 ° T	01	-	Illegal	Action			$N < 2$
7	5,000	000 ° T	05	-	Illegal	Action			$N > 4$

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B7. Verify correct presentation of circular screen (equal and unequal spacing).

    a.   Hook Ownship (Course 000° T).

    b.   Enable and position ball tab at sonar range and screen axis specified in Table B7 for Test Condition 1.

    c.   Set N219 in NED (N from Table B7) and enter F CODE to specify equally spaced circular screen.

    d.   Enter SCREEN via QAB.

    e.   Observe PPI for circular screen presentation and DRO for screen axis readout.

    f.   Hook a screen station to obtain station number readout on DRO.

    g.   Obtain range and bearing of the same screen station from Ownship (screen center) and record these data in Table B7.

    h.   Repeat Actions B7.f and g for each screen station displayed.

    i.   Acceptance criteria for Action B6:

        1.   Circular screen displayed on PPI.

        2.   Correct geometry as verified by record of observed screen station number, range, and bearing data on Table B7.

    j.   Delete screen presentation.

    k.   Repeat Actions B7.a through i except for the following changes:

        1.   In Action B7.b use Test Condition 2 data from Table B7.

        2.   In Action B7.c set N319 in NED to specify unequally spaced circular screen (N from Test Condition 2).

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TITLE

TABLE B7 CIRCULAR SCREENS

DATE

| TEST CONDITIONS | INPUT | | N (# Sta.) | STA # | RESPONSE | | | |
| | SONAR RANGE | SCREEN AXIS | | | CORRECT | | OBSERVED | |
					Range	Bearing	Range	Bearing
1	1,000	000 ° T	16	1	5120yds	011 ° T		
Equal				2	"	349 ° T		
Spacing				3	"	034 ° T		
				4	"	326 ° T		
				5	"	056 ° T		
				6	"	304 ° T		
				7	"	079 ° T		
				8	"	281 ° T		
				9	"	101 ° T		
				10	"	259 ° T		
				11	"	124 ° T		
				12	"	236 ° T		
				13	"	146 ° T		
				14	"	214 ° T		
				15	"	169 ° T		
				16	"	191 ° T		
2	2500yds	000 ° T	7	1	8000yds	000 ° T		
Unequal				2	"	321 ° T		
Spacing				3	"	039 ° T		
				4	"	274 ° T		
				5	"	086 ° T		
				6	"	218 ° T		
				7	"	142 ° T		

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C. ASW Search Plan Tests

Various ASW search plans are tested for correctness of the displayed plan using ATP 1 (A) as a source.

The following comments apply to this series of tests:

- No simulated tracks are required.

- Course and speed for tracks are entered by using NED entries

  for Permanent Course Override and Permanent Speed Override,

  and the Function Code QAB.

- In order to verify correct presentation each plan displayed on the

  PPI will be recorded on 35 mm film for later examination. The

  appropriate Search Plan Test # and range scale setting is to be

  included in each photograph.

Test Details

C1. Verify correct presentation of a Duet search plan.

   a. Refer to Table C, Search Plan Test #1.

   b. Enter firm tracks as specified in Columns 2 to 6 at the Surface

      Detector/Tracker console.

   c. Enter NED entry for ASW search parameters specified in column 7,

      if any.

   d. Employ Hook and Ball Tab as stated in columns 8 and 9, respectively.

   e. Enter NED entry in column 10 to call-up search plan display.

   f. Observe PPI display, identify, and record plan type in columns 13

      and 14 to compare with "correct" information in columns 11 and 12.

   g. Photograph PPI display along with provision for Search Test Plan

      # and Range scale to appear in photograph.

    h.   Delete the search plan from display.

C2. Verify correct presentation of a Triplet search plan.

    a.   Refer to Table C, Search Plan Test #2.

    b.   Repeat Actions Cl.c through h.

C3. Verify correct presentation of a Tomato search plan.

    a.   Refer to Table C, Search Plan Test #3.

    b.   Repeat Actions Cl.c through h.

C4. Verify correct presentation of a Trireme search plan.

    a.   Refer to Table C, Search Plan Test #4.

    b.   Repeat Actions Cl.c through h.

C5. Verify correct presentation of a Spiral search plan.

    a.   Refer to Table C, Search Plan Test #5.

    b.   Enter speed for track #1 from column 6.

    c.   Repeat Actions Cl.c through h.

C6. Verify correct presentation of a Lemon search plan.

    a.   Refer to Table C, Search Plan Test #6.

    b.   Enter Datum as specified in columns 2 to 4 and record time of entry.

    c.   Repeat Actions Cl.c through h.

C7. Verify correct presentation of Keylime search plan.

    a.   Refer to Table C, Search Plan Test #7.

    b.   Repeat Actions Cl.c through h.

C8. Verify correct presentation of Tiger Two search plan.

    a.   Refer to Table C, Search Plan Test #8.

    b.   Repeat Actions Cl.c through h (Record time of entry for Action Cl.e).

C9. Verify correct presentation of Airplan 25 search plan.

    a. Refer to Table C, Search Plan Test #9.

    b. Repeat Actions C1.c through h. (Record time of entry for Action C1.e).

Note: If Time Late > 31 min. (elapsed time between entering Datum and requesting Airplan 25 search plan), an "Illegal Action" will result. In this case, drop previous Datum, re-enter at same position, and repeat test for Airplan 25.

Table C ASW SEARCH PLAN TESTS

COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4	COLUMN 5	COLUMN 6	COLUMN 7	COLUMN 8	COLUMN 9	COLUMN 10	COLUMN 11	COLUMN 12	COLUMN 13	COLUMN 14	COLUMN 15
				INPUT						RESPONSE				
SEARCH PLAN TEST #	Tracks Entered	Range (yds)	Bearing	NED ENTRIES Course	Speed (knots)	ASW Search Parameters	Hook	Ball Tab	NED ENTRY Disp./Del. Search Pattern	SEARCH PLAN Correct		DISPLAY Observed		
1	#1, DD	5000	040°T	04047	-	None	Track #1	Track #2	01-21	Duet I, (L,CCW)				
	#2, DD	7000	070°T	07047	-	None								
2	-	-	-	-	-	None	Track #2	Track #1	03-21	Triplet III, (R,CW)				
3	-	-	-	-	-	None	Track #1	-	04-21	Tomato				
4	-	-	-	-	-	None	Track #1	Enabled at 000°T @ 6000 yds	06021	Trireme I (L)				
5	-	-	-	-	01849 (track #1)	40-23	Track #1	Track #2	11021	Spiral, (short)				
6	DATUM (Time___)	5000	000°T	-	-	None	Datum	Enabled at 300°T @ 4000 yds	07521	Lemon II (N=5)				
7	-	-	-	-	-	None	Datum	Track #1	06-21	Keylime				
8	-	-	-	-	-	None	Datum	Track #1	12-21 (Time___)	Tiger Two				
9		-	-	-	-	06-23	Datum	Enabled at 000°T @ 8000 yds	25921 (Time___)	Airplan 25 (FSR=4500 yds)				

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D. Recommend Course and Speed Tests

This section tests the accuracy of the solution for recommended ship course and speed displayed on the DRO.

Wind simulation is required for these tests and the resulting data extraction (Redform 5) will be used to verify accuracy of generation and interpretation of the simulated wind velocity.

Test Details

D1. Verify correct computation and display of recommended ship course and speed.

a. Refer to Table D for test #1.

b. Generate simulated wind direction and speed at TG&C console and take appropriate action to obtain Redform 5 data extraction.

c. At operational console enter desired relative wind speed and direction using NED entries stated.

d. Enter request for display of recommended ship course and speed using NED entry stated.

e. Observe DRO for readout of desired wind parameters as entered in Action D1.c.

f. If no solution is displayed, record system response in Table D.

g. If solution is displayed, record recommended ship course and speed in columns provided in Table D.

h. Repeat Actions D1.b through g for remaining tests (#'s 2-6) in Table D.

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Table D RECOMMEND SHIP COURSE AND SPEED

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TEST #	INPUT						RESPONSE		
	WIND SIMULATION		NED	ENTRIES			RECOMM.	RECOMM.	
	Θ_w	S_w	Θ_d	S_d	Compute		COURSE	SPEED	
	Direction	Speed	(Rel. Dir.)	(Rel. Spd.)	& Display				
1	135 ° T	10 kts	None	None	---26				
2	135 ° T	10 kts	04524	22-25	---26				
3	135 ° T	10 kts	02724	22-25	---26				
4	135 ° T	15 kts	02724	22-25	---26				
5	075 ° T	40 kts	06024	16-25	---26				
6	270 ° T	12 kts	34024	24-25	---26				

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E. Helo Dipping Vector Tests

Tests for this Maneuver/Evaluation function on the CVS requires the following tracks be entered at the Surface D/T console:

Track #1 is a helo at a bearing of 000°T and 2000 yards range.

Track #2 is a surface track located relative to the helo at a

bearing of 090 °T and 12,000 yards range.

Update each track "in place" to obtain a firm track. Course and speed

will be provided by NED entries for Permanent Course Override and

Permanent Speed Override and F CODE QAB.

Wind simulation is required and the resulting data extraction (Redform 5) will

be used to verify accuracy of generation and interpretation of the

simulated wind velocity.

Enter Magnetic Variation of +10 at the Navigation keyset.

In order to verify correct presentation each helo dipping vector displayed

on the PPI will be recorded on 35 mm film for later examination. The appropriate

HDV Test # and range scale setting is to be included in each photograph.

Test Details

E1. Verify helo dipping vector accuracy.

    a. Refer to Table E, HDV Test #1-1.

    b. Simulate wind velocity specified in columns 2 and 3 and initiate

        data extraction on Redform 5.

    c. Enter course and speed for Track #2 from columns 4 and 5.

    d. Enter course and speed for Track #1 from columns 6 and 7.

    e. Use Hook and Ball Tab as given in columns 8 and 9.

    f. Initiate Helo Dipping Vector display with NED entry **CONFIDENTIAL**

given in column 10. Minimize elapsed time between

Actions E1.c and f to minimize change in the initial geometry.

g. Record PPI display of vector solution on 35 mm film.

Indication of range scale and HDV Test # will be included in the

photograph.

h. In columns 11 through 15 of Table E record the DRO data

displayed corresponding to the PPI display being photographed.

i. Terminate permanent course and speed override on Track #1 using

--- 246 in NEDs and F CODE QAB.

j. Repeat Action E1.i for Track #2.

k. Refer to Table E, HDV Test #1-2.

l. Repeat Actions E1.b through h.

m. Drop tracks #1 and #2.

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Table E. HELO DIPPING VECTOR

COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4	COLUMN 5	COLUMN 6	COLUMN 7	COLUMN 8	COLUMN 9	COLUMN 10	COLUMN 11	COLUMN 12	COLUMN 13	COLUMN 14	COLUMN 15
	INPUT									RESPONSE (DRO DATA)				
	WIND SIMULATION		NED ENTRIES						NED ENTRY					
HDV Test #	Direction	Speed	Tr #2 Course	Tr #2 Speed	Tr #1 Course	Tr #1 Speed	Hook	Ball Tab	Display HDV	TN (Hooked Track)	FIRST MANEUVER COURSE	SECOND MANEUVER COURSE	SPEED	TIME TO GO
											(Mag)	(Mag)		
1-1	270 T	10 kts	22047	00849	27047	11049	Track #1	Track #2	---11					
1-2	000 T	10 kts	18047	02049	00047	07049	Track #1	Track #2	---11					

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F. <u>Display Sonar Conditions Tests</u>

This series of tests checks the computation and display of specific sonar parameters from inputs entered at the ASW Keyset.

No simulation is required for these tests.

<u>Test Details</u>

F1. Verify correct computation and display of sonar conditions.

    a. Refer to Table F for Test #1.

    b. Enter the bathythermograph parameters given in columns 2 through 8 in their proper sequence at the ASW keyset (FSET 2, Para C.2.6.3)

    c. Enter request for display of sonar conditions using NED entry given in column 9.

    d. Record sonar data displayed on the DRO in columns 10 through 13.

    e. Repeat Actions F1.b through d for remaining tests (#'s 2-6) in Table F.

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TABLE F   SONAR CONDITIONS

COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4	COLUMN 5	COLUMN 6	COLUMN 7	COLUMN 8	COLUMN 9	COLUMN 10	COLUMN 11	COLUMN 12	COLUMN 13	COLUMN 14	COLUMN 15
				INPUT							RESPONSE			
ESR TEST	SEA STATE	TEMP. @ 15 Ft.	LAYER DEPTH	ASW K/S DEPTH	TEMP. @ Depth	SONAR PERF. FACTOR	OPERATOR FACTOR	NED ENTRY Display ESR	LAYER DEPTH (ft)	BEST SUB DEPTH(ft)	ESR (yards)	PERSC DEPTH RANGE (yds)		
#1	2	81.5° F	20 ft	9000 ft	34.3 °F	120	0	---22						
#2	3	50.0° F	190 ft	5000 ft	40.0 °F	150	2	---22						
#3	5	35.0° F	5 ft	1000 ft	33.5 °F	190	1	---22						
#4	0	65.0° F	600 ft	50 ft	75.6 °F	199	0	---22						
#5	4	40.0° F	80 ft	1500 ft	38.1 °F	145	2	---22						
#6	1	39.9° F	300 ft	175 ft	37.5 °F	160	1	---22						

G. Aircraft Status Tests

This section contains a series of tests to verify that status of friendly aircraft can be entered, stored, and displayed as defined in the specification.

- Simulation of air tracks is required. Geometry is not significant except to reduce confusion in hooking of desired track at operational console and to keep all tracks within the PPI display range. Simulated tracks are identified sequentially in this description from #1 through #13 proceeding from right to left of PPI and on parallel courses of 000°T. (See Figure G1).

- No other tracks should be in the system during this test.

- Two consoles are required during this test.

- Ownship speed 10 kts and course 000 °T.

Test Details

G1. Track Initiation

    a. At TG&C console enter the 13 tracks given in Table G1 each having the characteristics given in columns 2 through 9. Send radar on each track to the operational system and start all tracks simultaneously. During the test use Instant Course to reverse direction of any track(s) to keep them on the PPI display (256 mi. range scale).

    b. At Air D/T console hook the video corresponding to #1 track (see Figure G1 and Table G1) and make a New Track entry, update to firm status, and record CTSL/TN in column 2 of Table G2.

    c. Repeat Action G1.b for remaining tracks #2 through #6, and #9 through #13.

d. Repeat Action G1.b at Surf D/T console for #7 and #8 tracks.

e. Enter ID specified in column 3, Table G2 for each track in the system.

G2. Verify maximum of ten aircraft on which status information can be stored.

a. At the aircraft data entry keyset enter a New Data Track Number message for track #1 from Table G2, column 2.

b. At the keyset enter the status information given in columns 4 through 8, Table G2 for the same track. Record time of entry in column 9 of endurance parameter.

c. Repeat Actions G2. a and b for tracks 2 through 11.

d. Note system response to attempt to enter status information on track #11.

G3. Verify correct interpretation and display of keyset entries on aircraft status. Also verify that endurance is decremented at one minute intervals.

a. Hook each track on which status information was entered and record in Table G3:

1. Time that each track was hooked in column 2 and,

2. DRO readout for hooked track in columns 3 through 10.

G4. Verify system acceptance of "update" message on previously entered aircraft status.

a. Refer to Table G4.

b. At the aircraft data entry keyset make entries specified in columns 2 through 7 on #6 track.

c. At the console hook #6 track and record DRO data specified in columns 8 through 15.

d. Repeat Actions G4.b and c for #7 track and #8 track.

G5. Verify system acceptance of "delete aircraft status" message on previously entered aircraft status.

    a. At the aircraft data entry keyset enter a "Delete Track Number" message on #1 track (See Table G2).

    b. At console hook #1 track and observe that aircraft status information is not displayed on the DRO.

    c. Repeat Actions G5.a and b for #2 track and #3 track.

G6. Verify system acceptance of additional aircrafts' status made possible by deleting of certain tracks' status.

    a. Refer to Table G4.

    b. At the aircraft data entry keyset make entries specified in columns 2 through 7 on #11 track.

    c. At the op console hook #11 track (See Figure G1) and record DRO data specified in columns 8 through 15.

    d. Repeat Actions G6.b and c for #12 track.

G7. Verify system rejection of attempt to enter aircraft status on hostile aircraft.

    a. At the aircraft data entry keyset make each of the following entries on #13 track until the "ERROR" light is activated at the keyset.

    b. Enter New Data Track Number message.

    c. Enter Weapon Type message and numerals 101.

    d. Enter SIF Code message and numerals 222.

    e. Enter RADIO CALL message and numerals 666.
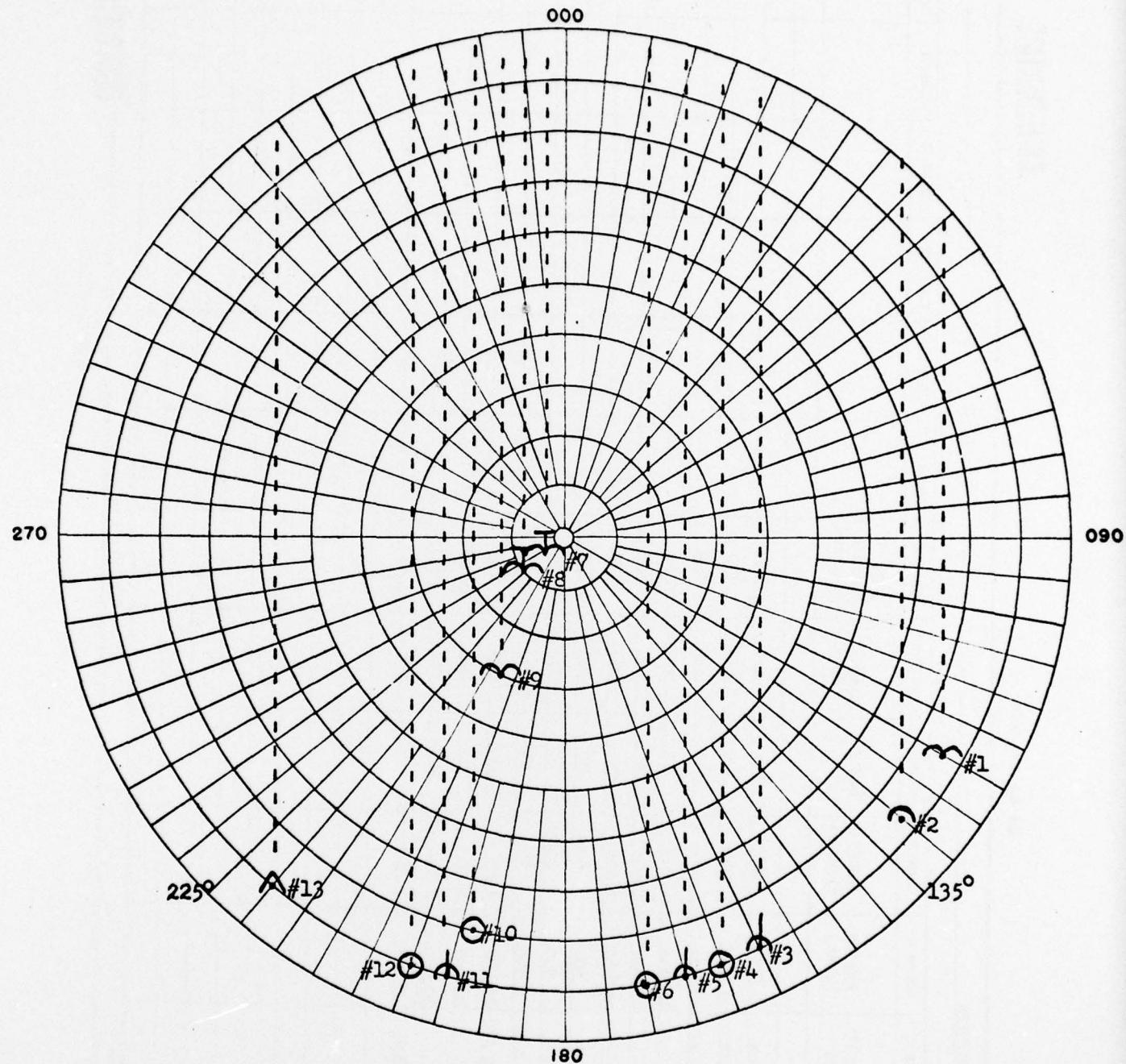
    f. Enter ENDURANCE message and numerals 111.

g. Enter A/C TYPE message and numerals 02.

h. Following activation of ERROR light at keyset, hook #13 track at the OP console and record status information displayed on DRO, if any.

- - - - Path of aircraft

FIGURE G1   Aircraft Track Numbering and Initial Positions
on PPI (256 n.m. range scale).

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TABLE G1 TR&C ENTRIES

COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4	COLUMN 5	COLUMN 6	COLUMN 7	COLUMN 8	COLUMN 9	COLUMN 10	COLUMN 11	COLUMN 12	COLUMN 13	COLUMN 14	COLUMN 15
	RADAR													
TRACK #	Beam	RPM	TARGET TYPE	HEIGHT (feet)	SPEED (knots)	RANGE (n.m.)	COURSE (degrees)	TRUE BEARING (degrees)						
1	1.5	10	PATROL	5,000	300	215	000	120						
2			PATROL	5,000	300	215	000	130						
3			HSPD A/C	40,000	1,000	225	000	155						
4			"	20,000	1,000	225	000	160						
5			"	40,000	1,000	225	000	165						
6			"	30,000	1,000	225	000	170						
7			DRONE	500	60	10	000	235						
8			HELO	500	80	25	000	230						
9			ASW A/C	1,500	130	75	000	205						
10			HSPD A/C	20,000	1,000	200	000	193						
11			"	20,000	1,000	225	000	195						
12			"	30,000	1,000	225	000	200						
13	1.5	10	PATROL	5,000	300	225	000	220						

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TABLE G2 ID & AIRCRAFT STATUS ENTRIES

COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4	COLUMN 5	COLUMN 6	COLUMN 7	COLUMN 8	COLUMN 9	COLUMN 10	COLUMN 11	COLUMN 12	COLUMN 13	COLUMN 14	COLUMN 15
TRACK #	Record CTSL/TN	ENTER ID	A/C TYPE	WEAPONS Type/War-hd/Quant'ly	SIF CODE	RADIO CALL	ENDURANCE	Entry Time						
1		F/W ASW	01	000	315	869	250							
2		ASW	02	112	291	252	250							
3		INTCPTR	12	409	002	070	120*							
4		CONF FRND	11	113	159	763	115*							
5		INTCPTR	10	507	900	309	110*							
6		CONF FRND	09	212	370	820	100*							
7		DASH	05	416	368	486	70*							
8		HELO	04	304	293	498	90							
9		F/W ASW	03	201	476	365	60							
10		CONF FRND	06	105	241	555	10*							
11		INTCPTR	07	308	303	123	20*							
12		CONF FRND	08	409	869	987	30*							
13		HOSTILE	-	-	-	-	-							

* omit Endurance entry if ERROR displayed at Keyset

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TABLE G3   DRO DISPLAY OF AIRCRAFT STATUS INFORMATION

COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4	COLUMN 5	COLUMN 6	COLUMN 7	COLUMN 8	COLUMN 9	COLUMN 10	COLUMN 11	COLUMN 12	COLUMN 13	COLUMN 14	COLUMN 15
					DRO DATA									
	Time of Readout	Hooked Track CTSL/TN	NR OF WEAPONS	WEAPON TYPE	A/C TYPE	WARHEAD TYPE	SIF CODE	RADIO CALL	ENDURANCE (minutes)					

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TABLE G4. VERIFY RESPONSE TO UPDATE ENTRIES & NEW DATA ENTRIES FOLLOWING DELETE ENTRIES

| | | | | INPUT | | | | | | | | RESPONSE | | | |
COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4	COLUMN 5	COLUMN 6		COLUMN 7	COLUMN 8	COLUMN 9	COLUMN 10	COLUMN 11	COLUMN 12	COLUMN 13	COLUMN 14	COLUMN 15
TRACK	NEW DATA TN	UPDATE TN	A/C TYPE	WEAPONS Type/War-hd/Quant'y	ENDURANCE	SIF	RADIO CALL	CTSL/TN	NR OF WEAPONS	WEAPON TYPE	A/C TYPE, WARHEAD TYPE	WARHEAD TYPE	SIF CODE	RADIO CALL	ENDURANCE
			**			**	**								
#6	-	*	12 **	503	122	499	333								
#7	-	*	-	202	015	-	-								
#8		*	02**	113	060	777	280								
#11	*	-	07	201	031	400	269								
#12	*	-	08	313	210	413	707								

* from Table G2, column 2 for appropriate # track

** Omit these entries from Update entry if ERROR displayed at Keyset

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Section III.   TEST SUPPORT REQUIREMENTS

A. Personnel Requirements

The following listing shows the number and types of personnel required on the floor during this Acceptance Test.

Type	Number
Simulation Operator	1 (Tests D, E, G)
Operational System Operators	1 (Tests A, B, C*, D, E*, F) 2 (Test G)
Data Recorder	1 for each oper. console operator
Simulation Deputy	1 (if concurrent test underway)
Test Director	1

*Photographing of PPI display required.

B. Equipment/Facilities Requirements

Since a photographic record of the PPI display is required in Tests C and E, a 35 mm camera suitable** for this purpose is required. In addition, it is assumed that the complete Operational and TG&C systems have been checked out prior to the start of testing.

C. Software Requirements

No special software requirements are indicated.

**Provision for including range scale setting and test identification number in photograph.

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Section IV.   TEST SCHEDULE

An estimate of time required for testing is given below:

Test	Time (Minutes)
A. Hazardous Track	80
B. ASW Screen	105
C. ASW Search Plans	55
D. Recommend Course and Speed	35
E. Helo Dipping Vector	25
F. Display Sonar Conditions	30
G. Aircraft Status	195

These estimates add up to a total of $7\frac{1}{4}$ hours to complete all the tests and are considered to be conservative.   Time requirement should be less than estimated if test personnel and equipment function efficiently.

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